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(19) (CA) CANADIAN PATENT (12)

(54) Apparatus for Transmission of Heat Between Different
Liquid Media

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(57) 3 Claims

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Apparatus for heat exchange between different liquid media

The present invention relates to an apparatus for heat exchange between different liquid media, such as sludge, sewage water, industrial process water or the like, the transfer of heat being arranged to take place between two or more polluted media, between a polluted medium and a clean medium or vice versa.

There already exists an air-to-air apparatus for heat exchange as described, for example, in U.S. patent 4,141,412.

The object of the present invention is to provide an apparatus which would be compact, would afford an effective heat exchange, and would at least reduce the occurrence of its passageways becoming clogged.

According to the invention, a heat exchange apparatus is provided for heat exchange between different liquid media, such as sludge, sewage water, industrial process water or the like, wherein the heat exchange takes place either between two or more polluted media or between a polluted medium and a clean medium or vice versa. The apparatus presents a combination of a plurality of flat parallel sheets disposed one above the other to form a plurality of generally planar duct sections. A system of partitions disposed between each pair of adjacent sheets forms a duct. The intermediate duct panels can be arranged either in parallel or in series relative to each other. The apparatus further comprises means for conducting a hot and a cold medium, respectively, over the sheets such that the flow of hot and cold media takes place in cross- and counter-flow fashion along ducts. The partitions combining with the sheets to form the ducts, are duct detachable, straight or curved. They are clamped on by means of a frame in a liquid and air-tight fashion.

The invention will now be described in more detail and with reference to the accompanying drawing, in which FIGURE 1 is a simplified, diagrammatic perspective

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view, showing an embodiment of the apparatus with certain parts broken away or removed for clarity; and FIGURES 2 and 3 are diagrammatic plan views showing two alternatives of the partitions as mentioned above.

FIGURE 1 shows an apparatus in which a hot and a cold medium, respectively, are conducted over a number of flat parallel sheets A. In the shown embodiment, the sheets A are horizontal and are located one above the other. The flow between a hot medium through duct C and a cold medium through duct D, respectively, takes place in cross- and counter-flow fashion. The transfer of the hot medium and the cold medium D, respectively, from one sheet plane or duct section to another takes place by means of four end boxes E. *external return head.*

The ducts C, D can be produced in different ways. They can be connected in parallel or in series. In the shown embodiment, the ducts C on the hot side and ducts D on the cold side, respectively, are located at right angles to one another. Thus, all ducts C on the hot side and on the cold side respectively are cleanable and accessible from two separate directions upon removal of cleaning door B.

The length, width and height of the ducts can be varied at both the hot and the cold side. The length, width and height of the ducts does not have to be the same at the hot side as that of the cold side. *(internal bends) Fig. 3*

The speed of the medium flow in duct bends G may be varied in relation to the speed of the medium in the straight section H of the same duct. This is accomplished by the partitions forming the ducts being detachable from the panels A.

The partitions I are firmly clamped to the adjacent panels A by means of a frame J shown only diagrammatically by a broken line, as covering the top panel A to provide a sealed arrangement. The partitions I can be arranged in the form of either one of the alternatives shown in FIGURES 2 and 3. *(internal return head) Fig. 3*

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The design of the apparatus or the heat exchanger permits heat exchange from one medium to one medium or from a plurality of media to one medium in one and the same apparatus. For example, cold sewage sludge entering the apparatus can be placed into heat exchange with outgoing hot sewage sludge to a certain technical/economic limit. Subsequently, the remaining amount of energy in the outgoing hot sewage sludge can be utilized by transfer of heat to, for example, a glycol circuit which, in turn, preheats cold incoming ventilation air by means of a glycol/air battery. The cold medium can be finally heated to the required extent, for instance by hot water from a boiler, heat pump of the like. The transfer of heat between sludge/glycol circuit and between hot water/sludge respectively takes place in the same manner as in the case of a sludge/sludge application, and all transfer of heat thus takes place in the same apparatus or heat exchanger.

An alternative with a heat pump would also be feasible. In such a case, the heat pump utilized the outgoing hot sludge as heat source. The heat from the heat pump can either heat the cold medium on the apparatus or heat exchanger or transfer the heat to some other application, such as heating of water, heating of air or the like.

The invention is obviously not limited to the described embodiment, but can naturally be varied within the scope of the present invention.

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The embodiments of the invention in which an exclusive right or privilege is claimed are defined as follows:

1. Apparatus for heat exchange between different liquid media, such as sludge, sewage water, industrial process water, wherein the heat exchange is to take place either between two or more polluted media or between a polluted medium and a clean medium or vice versa, comprising, in combination a plurality of flat parallel sheets or panels disposed one above the other; duct means for conducting a hot medium and a cold medium, respectively, over the sheets such that the flow of hot and cold media takes place in cross- and counter-flow fashion, the transfer of the respective medium from one sheet or panel to another sheet or panel being provided for by at least two end boxes; each duct means being defined by a pair of said sheets or panels disposed one next to the other, and by straight or curved partitions detachably clamped in a liquid and air-tight fashion to said pair of sheets or panels by means of a clamping device.

2. An apparatus according to claim 1, wherein the sheets or panels are rectangular and form a rectangular prism-shaped stack; the partitions are straight; the duct means on a hot side and on a cold side of the apparatus, respectively, are coextensive with generally vertical planes disposed at right angles relative to each other, and four cleaning doors are removably engaged in air and liquid tight fashion, to the sheets or panels and to ends of the respective partitions, one at each side of the stack, whereby the respective duct means is cleanable and accessible simultaneously from two opposed directions upon opening or removal of the opposed doors.

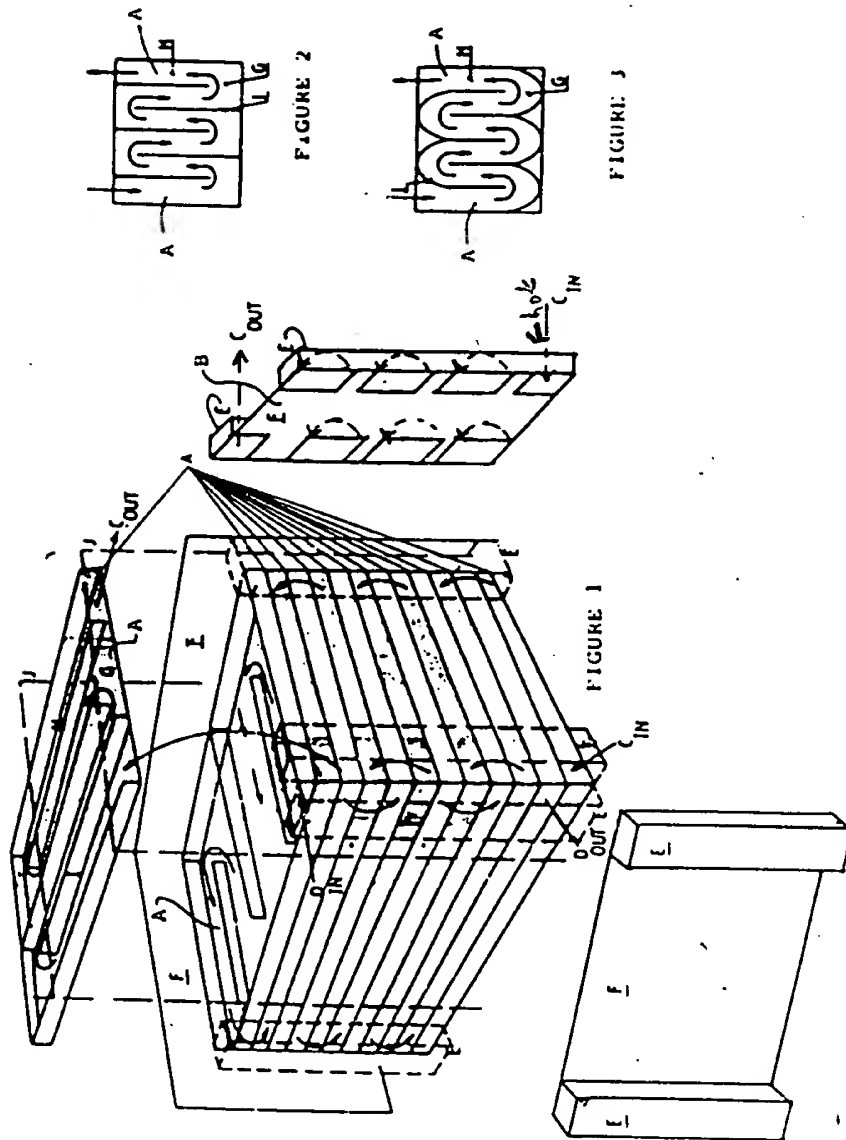
3. An apparatus according to claim 1, characterized in that the speed of the medium in bends of the duct means is variable in relation to the speed of the medium in straight portions of the duct means.

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